Journal of the Society of Arts.

FRIDAY, SEPTEMBER 4, 1863.

NOTICE TO INSTITUTIONS.

The Programme of the Examinations for 1864 is now ready, and may be had *gratis*, on application to the Secretary of the Society of Arts.

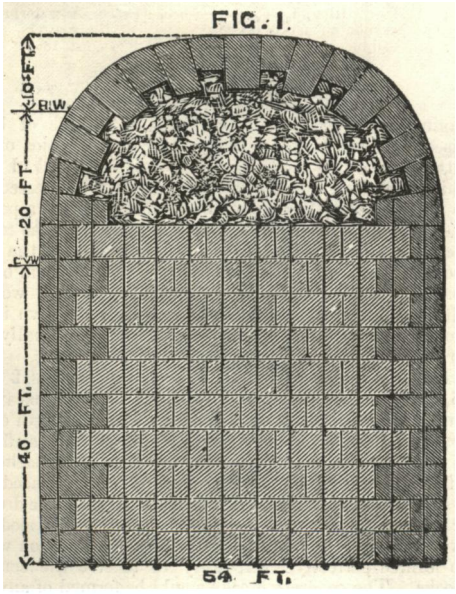
The Papers set at the Final Examinations held in May last are also published, and may be had of the Society's publishers, Messrs. Bell and Daldy, Fleet-street, price sixpence.

IMPROVEMENTS IN THE CONSTRUCTION OF HARBOURS, BREAKWATERS, PIERS, JETTIES, SEA AND RIVER WALLS, &c.

By ALEXANDER DOULL, C.E.

Fig. 1 is the section of a breakwater with vertical walls constructed in 10 fathoms water, 40ft. below low water, and 20ft. between high and low water, and 10ft. above high water, making 70ft. as the whole height of the structure.

FIG. 1.



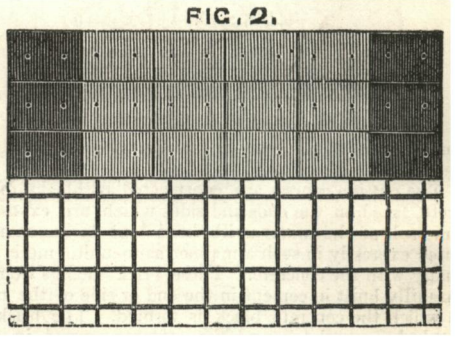
The section is 54ft. wide at the base, and is carried up perpendicularly to about 10ft. above low-water line, and is then finished by a flat curve. It is considered that the curved form given to the top of the work will secure the stones more firmly in their positions, and will allow the top of the wave to pass over the wall and fall into the harbour without propagating a wave, or causing an inconvenient disturbance of the water in the harbour, and also with the least possible injury to the wall. In this section the work is composed of stone blocks, averaging 9ft. long, 4½ft. broad, and 4½ft. thick, weighing about 11 tons each. These stone blocks are placed headers and stretchers in the outside of the work, the inside being filled up by concrete blocks of the same dimensions. The dimensions of the blocks, both of stone and concrete, would, however, be occasionally varied in length and thickness, in order the more effectually to break bond horizontally and vertically. The concrete blocks in the interior of the work would be continued up to low-water line, after which the centre of the work would be composed of concrete in mass, and the outside and top of stone blocks, which may be cramped together in any convenient manner.

The blocks of stone and concrete are placed in position up to the low-water line by guide rods of malleable iron, about 3in. diameter, two rods passing through each block. The holes in the blocks of stone would probably be more economically and accurately bored by machinery; the holes in the concrete blocks would be moulded in them at the time of their formation, and would consequently cause no additional expense.

During the process of construction, the rods would be carried up to the staging, and the upper ends of them secured in such a manner that any two of them could be disengaged and inserted into the hole of the block previously to its being lowered into its position from the staging.

In order to place the rods at the proper distance from each other, and to retain them in that position, agreeing accurately with the holes in the several blocks, the grating (fig. 2) is made use of. It is composed of flat bars of malleable iron, about 6in. broad, and half an inch thick, rivetted or welded together, and holes bored in the intersections of the bars accurately corresponding to the holes in the block. This grating would be formed in convenient lengths.

FIG. 2.



The rods having been screwed together and the upper ends attached to the platform as near their proper positions as possible, and their lower ends resting on the ground, the grating is passed over the ends of the rods and allowed to drop down along the rods to the ground, and to rest upon the heads of the rods, and thus form an efficient gauge to preserve the rods in their proper relative positions ready for the deposit of the stone and concrete blocks. In connecting one length of the grating with a previous one in the onward progress of the work, the advanced row of rods must be left clear of blocks, in order that the set of holes in the next portion of grating shall pass over the rods in the advanced holes of the previous grating. It will thus be observed that two sets of holes will pass over one set of rods at the junction of every successive portion of the grating.

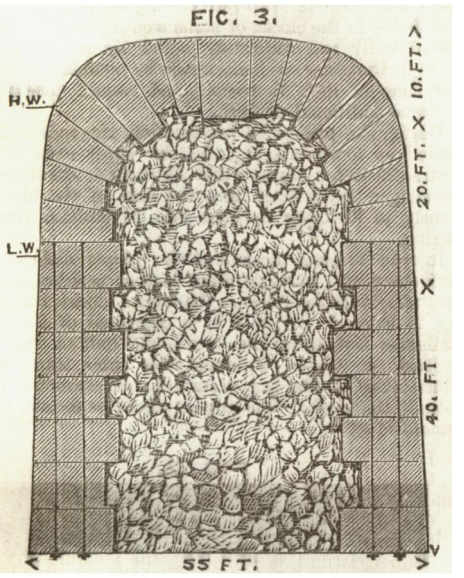
This mode of construction would be well suited for such works as those which are at present being carried on in connection with the proposed Harbour of Refuge at Dover, and which is said to cost about £1,100 or £1,200 per yard forward. The slow progress of the works, consequent upon diving-bell operations, is so great, and the expense of construction so excessive, that no reasonable hope can be entertained of ever obtaining a Harbour of Refuge at Dover by the means at present in operation.

The only alteration necessary to be made from the above in the construction of *circular pierheads*, would be to form the iron grating used for the proper adjustment of the guide rods in a circular or any other required form, and to prepare the holes in the stone or concrete blocks to

correspond to the position of the rods. This, it is presumed, would be an expeditious and cheap mode of constructing pier-heads in connection with breakwaters where the whole of the materials had been thrown into the sea from tramways, but where the pier-heads are, as at present, constructed by the aid of the diving-bell.

The following (fig. 3) is a still cheaper mode of

FIG. 3.



constructing a harbour of refuge than that already described:—

The outside courses are constructed of blocks of concrete, faced on the ends and sides which are exposed to the wash of the water, with hard blue bricks, manufactured expressly in such a manner as to unite more effectually with the concrete. These brick facings would be carefully built in cement in the end or side of the mould in which the concrete block is formed. The brickwork would be completed, and the concrete poured in afterwards, or the two materials could be applied simultaneously. Holes for the guide rods would be preserved in the blocks when they are being moulded.

Blocks of a large size may also be used, probably from 40 to 50 tons weight; and by substituting cast for malleable iron in guide rods, it being more durable than malleable iron in sea water, considerable stability would be derived from the guide rods, as they could be screwed into proper gauge by the grating already described.

The centre of a construction of this description may be composed of rubble stone, brought up in layers corresponding with the outside block courses. On the top of each layer of stone, liquid concrete would be put down in boxes or leather tubes, sufficient to fill up the interstices of the stone rubble.

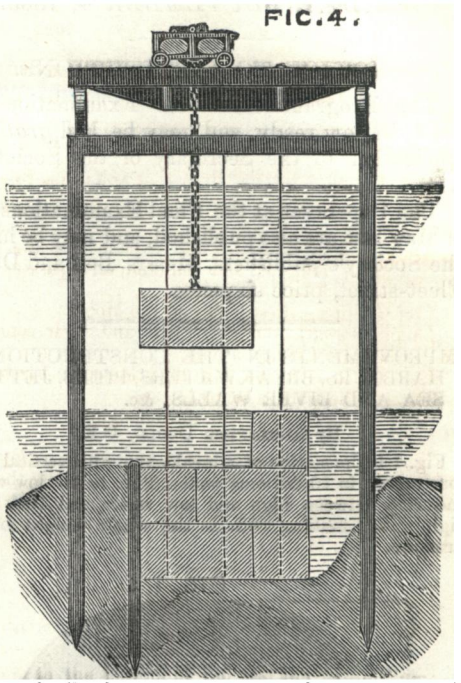
In some situations the chalk could be employed for the purpose of filling. The only essential condition in this case would be, that no water be allowed to pass in through the exterior block casing to wash away the chalk. The economy would also be very great where hard block chalk in abundance can be found upon the spot.

The expense of a structure of this description would probably be about £150 per yard forward, or about two miles of wall for little more than half a million of money.

In constructing a breakwater (such, for example, as in the bay of Wick), where the stone to be used is of the nature of slate, or large slabs comparatively thin: in this case it is essential that the stone should be placed vertically in the outside of the work; for, if large flat stones are thrown into the sea from a staging, they would spread out to a very inconvenient extent.

For the purpose of placing the stones composing the outsides of the work in a vertical position, or nearly so, a frame (somewhat similar to those used in hoisting materials to buildings) would be used, extending from the

FIG. 4.



staging to the bottom of the sea, and capable of being raised or lowered according to the irregularities of the bottom. To this frame a slide would be attached upon which the stone would be placed, and, when lowered into its position, the slide would be so arranged that a portion of it would be acted upon from the platform so as to cast the stone forward into its place. The weight of the stone about to be placed would press out the lower end of the vertical frame sufficiently far from the finished work to admit the deposit of stones successively sent down in the progress of the work. A diver could be occasionally sent down to examine the progress of the work.

Fig. 4 is a cross section of a river wall, about 12 ft. or 15 ft. below low water, and in about 10 ft. of excavated mud or gravel. Staging is erected over the length of the portion of wall in progress, and the excavation is effected to the necessary depth by a vertical dredger, attached to a traveller in such a manner as to be readily placed over every portion of space to be operated upon. The dredger or excavator would be lowered as the work progressed, and by this means the bottom of the excavated portion would be formed perfectly level, ready to receive the concrete blocks. The concrete blocks would be formed of any convenient size, and each block would have two holes in it, for the purpose of being placed in position, as above described with reference to breakwaters.

Cast-iron sheet piling would be driven on the river side to protect the concrete blocks from the action of the current, and also to guard against injury to the foundation by the scouring out of the bed of the river when its breadth had been contracted.

This sheet piling on the river side, and temporary sheet piling on the land side, would be necessary to preserve the proper form of the excavation until the concrete blocks have been deposited.

This mode of putting in the foundation of river walls, it is presumed, is peculiarly applicable to the embankment of the north and south sides of the Thames, about to be undertaken by the Board of Works—more efficient and more economical than by sinking cylinders by divers.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, NEWCASTLE-UPON-TYNE, 1863.

The following is a list of the Papers read in the various Sections:—

THURSDAY, AUGUST 27TH, 1863.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Fleeming Jenkin.—Report of the Committee on Electrical Standards.

Rev. Dr. Robinson.—Report of the Committee on Fog Signals.

E. J. Stoney.—Interim Report on Molecular Physics.

Fleeming Jenkin.—Interim Report on Thermo-electrical Phenomena.

Abbé Moigno exhibited and explained on the part of MM. Eugène Bourdon and Salleron, an apparatus called an "Injector of Solids."

Prof. Phillips.—Researches on the Moon.

Balfour Stewart.—On Sun Spots and their connection with Planetary Configurations.

Prof. Coffin.—On the path of a Meteoric Fireball relatively to the Earth's centre.

Prof. C. P. Smyth.—On the changing colour of the Star 95 *Herculis*.

Hermann Schlagintweit.—On a new Revolving Scale for measuring curved lines, communicated by the Abbé Moigno.

A. Claudet.—On some Phenomena produced by the refractive power of the eye.

SECTION B.—CHEMICAL SCIENCE.

Address by the President.

I. Papers on Local Manufactures—

Glass and Earthenware.

Fire Clay Goods.—By Joseph Cowen, Blaydon Burn.

Glass.—By R. W. Swinburne, South Shields.

Earthenware.—By C. T. Maling, Newcastle.

II. On the Oxidation of β Hexylic Alcohol.—By Prof. Wanklyn, F.C.S.

III. Some results of experiments on Lucifer Matches and others ignited by Friction.—By F. A. Abel, F.R.S.

IV. On the presence of a Salt of Baryta in Colliery Water.—By T. Richardson, Ph. D.

V. On a New Gas Furnace for Scientific and Practical purposes.—By George Gore, Birmingham.

VI. On Disinfectants.—By H. B. Condy, F.C.S., Battersea.

SECTION C.—GEOLOGY.

The President.—Opening Address.

Nicholas Wood, John Taylor, John Marley, and J. W. Pease.—On Coal, Coke, and Coal Mining in Northumberland and Durham.

John Hogg, M.A., F.R.S.—On the Fossil Teeth of a Horse found in the Red Clay at Stockton.

J. P. Lesley.—On the Coal Measures of Sydney, Cape Breton.

G. B. Forster and John Daglish, F.G.S.—On the Magnesian Limestone of the County of Durham.

Professor Harkness, F.R.S.—Skiddaw Slate Fossils.

Professor Harkness, F.R.S.—On the Hornblendic Greenstones and their relations to the Metamorphic and Silurian Rocks of the County of Tyrone.

H. C. Sorby, F.R.S.—On Models illustrating the Contortions in Mica-Schist and Slate.

SECTION D.—ZOOLOGY AND BOTANY.

The President.—Introductory Remarks.

J. Gwyn Jeffreys, F.R.S.—Report of the Committee appointed for Exploring the Coast of Shetland by means of the Dredge.

George Hodge.—List of the British Pycnogonidæ, with descriptions of several New Species.

G. S. Brady.—On the Zoology of Hylton Dene, near Sunderland.

G. S. Brady.—On the Marine Cyclopoid Entomostraca (Calanidæ), with Notices of some Species New to Britain.

Dr. Davy.—On the Colour of the Salmon.

Joshua Alder.—Descriptions of New British Polyzoa, with remarks on some imperfectly known Species.

Clements R. Markham.—On the Cultivation of Cinchona in India.

The President.—On the Structure of the Fruit of Clerodendron Thomsonæ (Balf), from Old Calibar.

Rev. H. B. Tristram.—On some elucidations of the Geological History of North Africa, supplied by its lacustrine Fauna.

SUB-SECTION D.—PHYSIOLOGY.

The President's Address.

Dr. Embleton.—Notes on certain parts of the Anatomy of a young Chimpanzee.

Dr. Davy.—Observations on the Eggs of Birds.

Stewart Clark.—On the Ventilation of Barracks and other Public Buildings in India.

Dr. William Murray.—On the Investigation of Instinctive Actions.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

President's Address.

Captain Bedford Pim, R.N.—Proposed Inter-Oceanic and International Transit Route across Central America.

Captain George Fleming.—From Tientsin (North China) to the Capital of Mantchu Tartary.

John Crawfurd, F.R.S.—On the Commixture of the Races of Man as affecting the Progress of Civilisation in the New World.

Dr. James Hunt (Pres. Anthropological Soc.).—On Anthropological Classification.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

President's opening remarks.

Dr. Jas. Bird.—On the Vital and Sanitary Statistics of our European Army in India, compared with those of the French Army under like conditions of Climate and Locality.

C. H. Bracebridge.—Coventry Freehold Land Society.

Frederick Purdy.—On the decrease of the Agricultural Population of England, A.D. 1851-61.

Henry Fawcett.—On the effects of the recent Gold discoveries.

SECTION G.—MECHANICAL SCIENCE.

C. T. Porter.—Richard's Indicator for Steam Engines.

P. Westmacott and J. F. Spencer.—Engineering Manufactures of the Tyne and Neighbouring Districts.

J. Jamieson.—Air Engines.

Robert and William Hawthorn.—New Method of Working Railways by Stationary Engines.

R. A. Peacock.—New Plan for Hanging Dock Gates.

Geo. Fawcus.—A New Method of Constructing Boats, so that any number may be packed one inside the other.

D. Puseley.—On Thompson's Universal Stopper for Bottles, Casks, &c.

In the evening, at 8 o'clock, a conversazione took place at the Central Exchange News Room.

FRIDAY, AUGUST 28, 1863.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

B.S. Proctor.—On the Focal Adjustment of the Eye.

A. Claudet.—On the Star Chromatoscope.

Dr. Akin.—On the Transmutation of Spectral Rays.

Abbé Moigno exhibited and described M. Soleil's Tenebroscope for showing the Invisibility of Light.

Prof. C. P. Smyth.—On the Newcastle Time Gun.

Prof. D. E. Hughes.—On a Printing Telegraph.

W. Cook.—On Bonelli's Printing Telegraph.

W. Ladd exhibited a new form of Syren.

W. Ladd exhibited an Acoustic Telegraph.

W. Ladd exhibited an Electro-motive Engine.

R. S. Browne.—On the Distances of the Planets.

C. W. Siemens.—On the Electric Resistance and the Electrification of India-rubber under a pressure of 300 tons.

SECTION B.—CHEMICAL SCIENCE.

Report of the Committee on Gun Cotton.

Papers on Local Manufactures.

J. C. Stevenson, R. C. Clapham, and T. Richardson.—Chemical Manufactures.

J. Pattinson.—On the various kinds of Pyrites used on the Tyne and Neighbourhood for the Manufacture of Sulphuric Acid.

SECTION C.—GEOLOGY.

Dr. Dawson.—On two new Coal Plants from Nova Scotia.

H. C. Sorby.—On Models illustrating the Contortions in Mica-schist and Slate.

Prof. Ansted.—On a Deposit of Sulphur in Corfu.

Prof. Ansted.—On the Metamorphic Origin of the Porphyritic Rocks of Charnwood Forest.

E. Holl.—On the Laurentian Rocks in the Malvern Hills.

Charles Moore.—On the Equivalents of the Cleveland-hill Ironstones in the West of England.

Charles Moore.—On the Organic Contents of the Lead Veins of Allenheads and of Yorkshire.

SECTION D.—ZOOLOGY AND BOTANY.

Rev. A. Merle Norman, M.A.—Report of the Committee appointed to dredge the Shetland Seas. Part II.

George Hodge, G. S. Brady, and Joshua Alder.—Report of the Committee for dredging the Coast of Durham and Northumberland.

John Leckenby.—Reports of the Results of a three weeks' Dredging Cruise off Scarborough, in 1863. Communicated by Captain Woodall.

Thomas Johnson.—An Account of the Attempts to transport Salmon to Australia.

J. Hogg.—On the Roman and Imperial Crested Eagles.

C. Spence Bate.—On a new species of Ione.

Dr. Maxwell T. Masters.—Note on certain influences regulating the forms of leaves, &c.

SUB SECTION D.—PHYSIOLOGY.

Dr. George D. Gibb.—Report on the Physiological effects of the Bromide of Ammonium.

Dr. B. W. Richardson.—On the Physiological properties of the Nitrite of Amyle.

Dr. Davy.—On the Blood in relation to the question: Is Ammonia one of its normal constituents?

Dr. Pavy.—On the reason why the Stomach is not digested by its own Secretion during life.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

J. Crawfurd.—A few Notes on Sir Charles Lyell's "Antiquity of Man."

Robert Swinhoe, H.M. Consul at Taiwan.—Geographical Notes on the Island of Formosa.

J. A. Lapham.—Some facts respecting the Great Lakes of North America.

Dr. James Hunt.—On the Physical and Mental Characters of the Negro.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Discussion on Mr. Fawcett's Paper, on the effects of the recent Gold discoveries.

James Heywood.—On the opening and extension of Durham University Academical Endowments.

Dr. Camps.—On the Sanitary condition of the Troops in India.

SECTION G.—MECHANICAL SCIENCE.

W. H. Richardson.—On the Paper Manufactures of Northumberland and Durham.

Discussion on Messrs. Hawthorn's Paper on a new method of working Railways by stationary Engines.

C. W. Siemens.—On regenerative Gas Furnaces as applied to Iron Works.

Messrs. E. Salmon and John Collinson.—Reports and Sections relating to Capt. Bedford Pim's projected Transit Route through Central America, shewing the *modus operandi* of surveying in the Forests of that Country.

D. D. Main.—Newcastle and Gateshead Water supply.

Admiral Sir E. Belcher.—Description of a Spirit Level Telescope for observing Altitudes and obtaining Latitudes independently of natural or artificial Horizons.

Abbé Moigno exhibited a Model and gave an explanation of Messrs. Bourdon and Salleron's Apparatus termed "Injecteur pour les corps solides."

C. B. King.—On extinguishing Fires.

In the evening Professor Williamson, F.R.S., delivered a discourse on the Chemistry of the Galvanic Battery, considered in relation to dynamics, illustrated by experiments.

SATURDAY, AUGUST 29TH.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

J. Glaisher.—Report on Luminous Meteors.

Professor Hennessy.—Interim Report on the Vertical Motion of Currents of Air.

Professor C. P. Smyth.—On a Proof of the Dioptric and Actinic quality of the Atmosphere at a high elevation.

Dr. Lee.—Description of a Solar Eye-piece, invented by Mr. Dawes, F.R.A.S.

Dr. Hincks.—On the Relationship between the variation of the Earth's Eccentricity and that of the Moon's Mean Motion in longitude.

Dr. Moffat.—On the Connection that exists between Admiral Fitzroy's "Caution Telegrams" and the Luminosity of Phosphorus.

SECTION B.—CHEMICAL SCIENCE.

Did not Meet.

SECTION C.—GEOLOGY.

Report on the Distribution of the Organic Remains of the North Staffordshire Coal-field.

Wm. Pengelly.—On the chronological value of the Triassic Rocks of Devonshire.

J. Alexander Davies.—On the causes of Earthquakes and Volcanic Eruptions.

Rev. James Brodie.—On the Physical Condition of the Earth in the earlier epochs of its history.

Harry Seeley.—On a Help to the Identification of Fossil Bivalve Shells.

W. Bainbridge.—On the Penine Fault.

Matthias Dunn.—On Coal in the Red Measures.

T. A. Readwin.—On the recent Discovery of Gold near Bala Lake, Merionethshire.

SECTION D.—ZOOLOGY AND BOTANY.

Did not Meet.

SUB-SECTION D.—PHYSIOLOGY.

Albany Hancock.—On the Renal Organ—the so-called water system in the Nudibranchiate Molluscs.

Professor Rolleston.—On the Renal Organ of the Aplysia.
William Turner—On Cranial Deformities, more especially on the Scaphocephalic Skull.
James Samuelson—On Life in the Atmosphere.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Professor Ansted, F.R.S.—On some Curiosities of Physical Geography in the Ionian Islands.
W. Wheelwright.—Central Argentine Railway from Rosario to Cordova and across the Cordillera of the Andes.
Osbert Salvin.—On the Physical Geography of Guatemala.
John Crawfurd.—On the so-called Celtic languages in reference to the question of Race.
R. S. Charnock.—On Celtic languages.
C. Carter Blake.—On some points in the Cranioscopy of the nations of South America.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Discussion on Dr. Camps' Paper, on the Sanitary Condition of the Troops in India.
Col. Torrens.—On Transportation in connection with Colonization.
Frederick Purdy.—On Mortality in Lancashire.
James Heywoood.—Remarks on Native Colonial Schools and Hospitals, from the Sanitary Statistics of Miss Florence Nightingale.
The late T. C. Angus.—Statistics of the Tanning Trade of Newcastle-on-Tyne (communicated by James Potts).

SECTION G.—MECHANICAL SCIENCE.

Dr. White.—On the Prevention of Fouling of Ships' Bottoms.
Dr. Gladstone and J. Scott Russell.—Report of the Joint Committee on Austrian Gun Cotton.
John Sturgeon.—Self-acting Valve Motion for Steam Hammers.

MONDAY, AUGUST 31ST.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

Col. Sykes.—Report of Balloon Committee.
J. Glaisher.—Report on Balloon Ascent.
J. J. Murphy.—On the distribution of heat on the Sun's Surface, and the Currents of his Atmosphere.
E. J. Lowe.—On Ozone, more especially on Ozone tests.
B. Stewart.—Comparisons of curves afforded by Self-Recording Magnetographs at Kew and Lisbon.
W. R. Birt.—On the Selenographical relations between the chain of Lunar mountains "the Alps," with the "Mare Imbrium," and the "Mare Frigoris." Communicated by Dr. Lee.
Prof. Chevallier.—Description of an Instrument for ascertaining the Height of a Cloud.
G. J. Symons.—Description of the experimental series of Rain-Gauges erected at Calne.
Rev. J. Rankine.—Meteorological Observations.

SECTION B.—CHEMICAL SCIENCE.

Professor Wanklyn.—On Fractional Distillation.
Dr. Matthiessen, and G. C. Foster.—On the Constitution and Rational Formula of Narcotine.
I. L. Bell, T. Sopwith, Dr. Richardson, and T. Spencer.—Report on the Metallurgy of the District.
Dr. Riley.—On Titanium in Iron.
J. Pattinson.—On deposit in blast furnaces.
J. Pattinson.—On Zinc, Nickel, and Cobalt in Cleveland Ironstone.
I. L. Bell.—On Aluminium.
Dr. Matthiessen.—Report on the Chemical Nature of alloys.

SECTION C.—GEOLOGY.

Alexander Bryson.—On the Origin of Granite.
Professor Phillips.—On the Deposit of the Gravel, Sand, and Loam, with Flint Implements at St. Acheul.
Professor Phillips.—On the drift Beds at Mundesley, Norfolk.
R. A. Godwin-Austen.—On the Alluvial Accumulations in the Valleys of the Somme and Ouse.
J. B. Jukes.—On certain Markings on the Horns of Megaceros Hibernicus.
G. E. Roberts.—On the Discovery of Elephant and other Mammalian Remains in Oxfordshire.
Dr. Hulburt.—Some Facts relating to the Hydrography of the St. Lawrence and the Great Lakes.

SECTION D.—ZOOLOGY AND BOTANY.

Dr. Hulburt.—Notes on Canadian Forests.
C. Carter Blake.—On the Syndactylous Condition of the Hand in Man and the Anthropoid Apes.
H. B. Brady.—Notes on the occurrence of Foraminifera new to the British Seas.
Prof. T. Rupert Jones and W. K. Parker.—Notes on some recent Foraminifera, dredged at Jamaica by the late Lucas Barret, F.G.S.
C. Spence Bate.—Notes on the Homologies of the Trilobites.
A. R. Wallace.—On the Geographical distribution of Animal life.
Rev. H. B. Tristram.—A few facts on the Variation of Species pointing to Western Asia as the centre of the Palœarctic Area of Creation.

SUB-SECTION D.—PHYSIOLOGY.

Dr. White.—On the Means of passing unharmed through noxious Gases or Vapours.
Dr. G. Robinson.—On the Nature and Varieties of Organic Effluvia.
Dr. George D. Gibb.—Further observations on the normal position of the Epiglottis.
Dr. George D. Gibb.—On voluntary closure of the Glottis, independently of the act of breathing.
Dr. Cleland.—On the ligamentous action of the long muscles in Man and other animals.
Dr. Cleland.—Note on the change of Attitude which takes place in Infants beginning to walk.
R. Garner.—On the Reciprocal Action between plants and gases.
Dr. G. Robinson.—On the practicability of arresting the development of Epidemic Diseases by the internal use of anti-zymotic agents.
Dr. Donkin.—On the physiological action of the Uterus in Parturition.
Professor Rolleston.—On the Condition of the Uterus after delivery in certain of the Mammalia.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Captain Grant.—On his Travels with Captain Speke from Zanzibar to the Sources of the Nile.
John Hogg.—A short Account of old Maps of Africa.
Signor Miani.—On his Travels towards the Sources of the Nile.
Baron von Heuglin.—On his exploration of certain Affluents of the Nile.
Mutu Coomara Swamy.—The Ethnology of Ceylon, referring especially to its Singhalese and Tamil Inhabitants.
George E. Roberts and Professor Busk.—Note upon the opening of a Cist of the Stone Age near the Coast of Moray Frith.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

Thomas Webster. — Report of the Committee on Technical and Scientific Evidence in Courts of Law.
William Henry Charlton.—A Statistical Account of the Parish of Bellingham.

Col. Sykes.—Military Budgets of English and French Armies, for 1863-4, statistically compared.

William Neilson Hancock, LL.D.—On the difference between Irish and English Poor-Law.

SECTION G.—MECHANICAL SCIENCE.

C. M. Palmer.—Iron Ship Building on the Tyne and neighbouring Districts.

Prof. Rankine.—On the Proportions of Ships of least Skin Resistance for a given Speed and Displacement.

Prof. Rankine.—An Investigation of Plane Water Lines for Ships.

Robert Taylorson.—The Diagonal Principle of Iron Ship-building.

Admiral Sir Edward Belcher.—A mode of rendering Timber-built Ships impregnable and unsinkable under moderate Crew Power, as in a leaky Vessel.

Admiral Sir E. Belcher.—On an improved Caisson Gate.

Abbé Moigno exhibited and gave Explanations of the "Ventilateur à Reaction" of Mons. Perigault de Rennes, and of the "Balance Aerostatique" of Mons. Seiler.

A *Soirée* took place at the Central Exchange Newsroom.

TUESDAY, SEPTEMBER 1ST.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENCE.

H. Swan.—On a new kind of Miniature, possessing apparent solidity by means of a combination of prisms.

Dr. Lee.—On the Lunar Mare Smithii, the Phillips' Walled Plain and the Percy Mountains.

Dr. Buys Ballot.—On the system of forecasting the weather pursued in Holland.

Dr. Akin.—Account of preliminary experiments on Chalkessence.

Professor Plücker.—On Spectral Analysis.

Dr. Gladstone and Mr. Dale.—On specific refractive energy.

Professor Sylvester.—On the quantity and centre of gravity of figures given in perspective, or homography.

S. Alexander.—On the augmentation of the apparent diameter of a body by atmospheric refraction.

J. J. Walker.—On the conditions of the Resolvability of Homogeneous, Algebraical Polynomials into factors.

T. Tate.—On the Elasticity of the Vapour of Sulphuric Acid.

Professor W. Thompson.—On the result of reductions of curves obtained from the self-recording Electrometer at Kew.

J. Swan.—On a Mercurial Air Pump.

W. Symons.—On a new Marine Barometer, and on a Maximum Thermometer with a new Scale.

SECTION B.—CHEMICAL SCIENCE.

I. L. Bell, T. Sopwith, Dr. Richardson, and T. Spencer—Report on the Metallurgy of the District, continued.

Dr. Richardson.—On the separation of Lead and Antimony.

W. Baker.—On the impurities contained in lead and their influence on its technical uses.

W. Crookes.—On Thallium.

I. L. Bell.—On Thallium.

Dr. Stevenson Macadam.—On the Analysis of Chinese Iron.

Dr. Davey.—On the slaking of quick-lime.

Dr. Zenner.—On impurities in Lead.

L. Kessler.—Sur les procédés de gravure du verre à l'aide de l'acide fluor-hydrique par impression de la réserve.

L. Kessler.—Sur des appareils nouveaux evaporant à multiple effet et à air libre nommés *Erorateurs*.

L. Kessler.—Sur les avantages commerciaux d'un nouveau sel de soude cristallisé.

Duncan C. Dallas.—On Photelectric Engraving and observations upon sundry processes of Photographic Engraving.

H. Kilgour.—Abstract of Paper: Are Nitrogen and Carbonic Oxide the Oxide of Carbon in different Allotropic or Isomeric states?

R. C. Clapham and J. Daglish.—On the Minerals and Salts found in Coal Pits.

Dr. Richardson.—Researches on the Manufacture of Prussiate of Potash by the late John Lee and T. Richardson.

M. l'Abbé Moigno.—Short communications on Galvanic Copper, Photo-lithography, and Photo-microscopic specimens.

SECTION C.—GEOLOGY.

Report on the Chemical and the Mineralogical Composition of the Granite of Donegal.

Professor James Thomson.—On the Origin of the Jointed Prismatic Structure in Basalts and other Igneous Rocks.

Professor T. Rupert Jones and J. W. Kirby.—On a Synopsis of the Bivalved Entomastraca of the Carboniferous Strata of Great Britain and Ireland.

Professor T. Rupert Jones and W. K. Parker.—Notes on some Fossil and Recent Foraminifera, collected in Jamaica, by the late Lucas Barrett, F.G.S.

J. W. Kirkby.—On some Fossil Fishes from the Permian Limestone of Fulwell, near Sunderland.

J. Gwyn Jeffreys.—Report of the Shetland Dredging Committee, in its Geological bearings.

J. Gwyn Jeffreys.—A list of the Upper Tertiary Fossils of Uddewalla, in Sweden.

Dr. A. W. Malm.—On the Upper Tertiary Strata of the Bohuslän District.

Nicholas Wood and Edward F. Boyd.—On a Wash or Drift through the Coal-field of Durham.

Sir Roderick I. Murchison and Professor Harkness.—Observations on the Permians of the N.W. of England.

Dr. Geinitz.—On a Salamander in the Rothliegendes.

Professor Harkness.—On the Reptiliferous and Footprint Sandstones of the N.E. of Scotland.

SECTION D.—ZOOLOGY AND BOTANY.

Thomas Bewley.—Description of a new Plant House. Communicated by N. B. Ward, F.R.S.

N. B. Ward.—A Brief Account of the Vegetation of the Cliffs of Mohir, Co. Clare.

Charles W. Peach.—On the Occurrence of the Sperm Whale (Physeter Macrocephalus) at Wick.

C. W. Rose.—Notice of a Monstrosity in a Whiting.

A. R. Wallace.—On the Physical Geography of the Malay Archipelago.

N. Newton.—On the Irruption of Syrrhaptes paradoxus.

H. T. Stainton.—On the Generic Characters furnished by the different Modes of mining Leaves adopted by the Larvæ of Micro-Lepidoptera.

Rev. A. Merle Norman.—On British Holothuriadæ with reference to new species.

Rev. A. Merle Norman.—On the Morphology of the Echinodermata of the Family Ophiuridæ.

Robert Swinhoe.—Report on the Natural History of the Island Formosa.

P. P. Carpenter.—Report on the Mollusca of California.

W. Harper Pease.—On the Great Division of the Pacific Ocean Fauna. Communicated by P. P. Carpenter.

John Hogg.—On the Proliferous Cones of the Common Larch.

John Hogg.—List of Rarer Phœnogamous Plants in the S.E. of Durham discovered since 1829.

SUB-SECTION D.—PHYSIOLOGY.

Dr. Junod.—On the Physiological Effect produced by several Apparatuses contrived for the purpose of causing a Vacuum upon the entire Body, or a part thereof.

Dr. Edward Smith.—On the Dietary of the Lancashire Operatives.

Dr. Wilson.—On the Coal Miners of Durham and Northumberland, their Habits and Diseases.

Dr. Edward Smith.—On the Dietaries of the Labouring Classes.

Thomas Nunnelly.—On the Calabar Bean.

R. Garner.—On a Parasitical Acarus of the Anodon.

B. W. Richardson.—Miners' Safety Mask for supporting Life in Fire-damp and other Noxious Vapour.

Dr. Kidd.—How to restore Drowned Persons, Patients in Chloroform Accidents, &c.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Lord Lovaine.—On the Recent Discovery of Lacustrine Human Habitations in Wigtonshire.

The Hon. R. Marsham.—Two Ascents of the Volcano of Misti.

Rev. J. E. Wood.—On the Rivers of the Interior of Australia.

Alfred Wallace.—On the Varieties of Man in the Malay Archipelago.

Captain Fleming.—Ethnology of Eastern Mantchuria.

Henry Duckworth.—On the Human Cranium found at Amiens.

William Turner.—On the Anatomical Characters of the Human Cranium found at Amiens.

SECTION F.—ECONOMIC SCIENCE AND STATISTICS.

The President.—The Statistics connected with the Architectural Improvements in the City of Paris.

Henry C. Allhusen.—The Volunteer Force; its comparative Cost, Development, present State, and Prospect.

W. Fallows.—On the Origin of the Stockton and Darlington Railway. Communicated by James Potts.

Thomas Robins.—Observations on Criminals.

John Lamb.—On the Reduction of the Death Rate in Gateshead by Sanitary Measures.

SECTION G.—MECHANICAL SCIENCE.

Professor Pole.—Description of the large Gyroscope used by Sir William Armstrong.

Professor Airy.—On Boiler Explosions.

J. F. Ure.—On the Improvements now being carried out in the River Tyne.

Captain Douglas Galton.—On Targets for Gunnery Experiments.

George Richards.—Rifled Ordnance.

Robert Davidson.—On the Decortication of Cereals.

Robert Davidson.—On Improvements in Machinery and Apparatus for Cleansing and Purifying Casks.

Samuel Firth.—The Application of Machinery to Coal Cutting.

Abbé Moigno.—Caselli's auto-telegraph from Paris to Marseilles.

Abbé Moigno.—Oudry's galvano-copper and galvano-copper paint applicable to buildings, armour plates for ships.

George Fawcus.—Improvements in Waggons and Gun Carriages.

Thomas Page.—On Bridge Foundations.

W. Smith.—Report of the Committee on Steam-ship performances.

W. Smith—Harding's Valve and Apparatus for Atmospheric Railway Propulsion.

W. Smith.—James Spence's method of covering Boilers, Pipes, and Cylinders of Steam Engines for preventing the Radiation of Heat.

W. Smith.—Gray's Portable machinery or apparatus for Riveting, Chipping, &c.

W. Smith.—Jackson and Watkins' arrangement of direct acting Steam Engines.

Benjamin Fothergill.—Bowns Tyre fastening.

George Redfern.—Corrugated iron armour plates.

Jos. Robinson.—Improved manufacture of biscuits.

Dr. White.—Plans for preserving wines without bottles.

On this evening Mr. Glaisher gave a lecture on his balloon ascents.

WEDNESDAY, SEPTEMBER 2ND.

SECTION A.—MATHEMATICAL AND PHYSICAL SCIENC

Prof. Rankine.—On the Mathematical Theory of Plane Water Lines.

W. H. Russell.—On a certain Class of Mathematical Symbols.

L'Abbé Moigno exhibited and explained the following instruments:—

A Free Air Barometer by the Abbé Jeannon; a Metallic, or Holosteric, Barometer, by M. Naudet; a new Micrometer, by M. H. Soleil.

L'Abbé Moigno exhibited Specimens of Telegraphic Facsimiles, produced by Caselli's method.

L'Abbé Moigno communicated a Paper by M. Oudry, on Galvanic Copper and its applications.

Fleeming Jenkin exhibited and explained a New Electrometer, by Professor W. Thomson.

SECTION B.—CHEMICAL SCIENCE.

Dr. Stevenson Macadam.—On the Analysis of Chinese Iron.

M. Geo. Ville.—Définer par la végétation, l'état moleculaire des corps. Analyser la force végétale par des essais raisonnés de culture.

Alphonse Gages.—Report on Synthetic Researches on the Formation of Minerals.

Dr. F. L. Phipson.—On a New Method of measuring the Chemical Action of the Sun's Rays.

Dr. F. L. Phipson.—On Musical Sounds produced by Carbon.

Dr. Murray Thompson.—On New Zealand Lignites.

Dr. Otto Richter.—On the Chemical and Physical Principles in connection with the Specific Gravity of Liquid and Solid Substances.

W. Symons exhibited a new form of Gas Battery.

Dr. T. Wood.—On Oxidation by Ozone.

Dr. S. Macadam.—On the Manufacture of Superphosphates and Dissolved Bones.

Dr. B. H. Paul.—Recent Applications of the Hydrocarbons derived from Artificial and Natural Sources.

Dr. Richardson and T. W. Bunning.—On the Uses of Fuel in Marine Boilers.

SECTION C.—GEOLOGY.

John Marley.—On the Occurrence of Rock Salt at Middlesbro'.

G. E. Roberts.—On some Remains of Bothriolepis from the Upper Old Red Sandstone of Elgin.

George Tate.—Description of a Sea Star (Cribellites Carbonarius), from the Mountain Limestone of Northumberland, with a Notice of its Association with Carboniferous Plants.

Charles Attwood—Some Facts observed in Weardale.

T. Sopwith.—On a Section of the Strata from Hownesgill to Cross Fell.

Prof. William King.—On the Neanderthal Skull, or Reasons for believing it to belong to the Clydian Period, and to be specifically distinct from Man.

Thomas Atthey and James W. Kirkby.—On some Fish Remains that have occurred in the Coal Measures of Durham and Northumberland.

SECTION E.—GEOGRAPHY AND ETHNOLOGY.

Colonel Pelly.—On the Tribes, Trade, and Resources around the shore line of the Persian Gulf.

J. Crawfurd.—On the Commixture of the Races of Man as affecting the progress of civilization in Eastern Asia and the Polynesian Islands.

Mr. Craft (an African Gentleman).—On his Visit to Dahomey.

Rev. G. R. Hall.—On the Aboriginal Occupation of North Tynedale and Western Northumberland. An illustration of the social life of the Northumbrian Celts.

J. Crawfurd.—The Origin of Gypsies.

George Petrie.—Antiquities of the Orkneys.

Professor Daniel Wilson.—Notice of the discovery of three additional Runic inscriptions in St. Molio's Cave, Holy Island, Argyleshire.

Hermann de Schlagintweit.—On Ethnographical Casts.

Vice-Consul Swinhoe.—Ethnology of the Island of Formosa.

Richard Lee.—The Extinction of Races.

George E. Roberts and Professor Busk.—Note upon the Opening of a Cist of the Stone age near the Coast of the Moray Firth.

FLAX IN SOUTH AUSTRALIA.

The following report on this subject has been addressed by Mr. McCalman to the Commissioner of Public Works in South Australia:—

Robe, Guichen Bay, May 27, 1863.

SIR,—I have the honour to acknowledge the receipt of your letter of the 7th inst. In accordance with your request I send you a brief report, stating my opinion as to the capabilities of the land in this district for the cultivation of flax. Although it is many years ago since the flax plant was discovered in Australia, yet it is by no means generally understood that the plant is indigenous, and this fact, as I shall subsequently point out, is one great recommendation for its being cultivated. The growing of flax in Australia has been at different times spoken of as an article of commerce, but the matter was allowed to drop, or laid aside, as a thing if not impossible at least improbable, the soil being in the estimation of some unsuitable, as well as the scarcity and price of labour being such as would make it unwarrantable even to give it a trial. On the subject of flax, Dr. Lang, in his "Philipsland," says:—"I have seen the wild flax growing myself on my brother's property on the Hunter, in New South Wales. Had I not known it was an indigenous plant I could not have distinguished it from the European variety." Then, again, speaking of the soil and climate of Victoria as being admirably adapted for the cultivation of flax, he further says:—"I cannot help regarding the circumstance as exceedingly important in its probable bearings, not only on the future advancement of the settlement, but on the empire generally." This is no mean authority, and there is one great fact that ought to be universally known in the commercial world, and that is that there are in Australia hundreds of thousands of acres of wild flax growing along the banks of the rivers, on the immense alluvial flats and numerous swamps, in some places so thick that it would be difficult to determine which was the predominant crop—grass, rushes, or flax. Years have now passed on, and no trial has been given to cultivate that valuable plant, which the very soil itself declares in unmistakeable language its suitableness to grow; yes, an indigenous plant, growing on land the least remunerative now, but which could be made the most productive land in the whole colony. Where my time and circumstances permitted me, I have made as minute an examination as I could over some of the large swamps and flats around here, and have found flax growing through all, in some parts thicker than others; and from small experiments I have made I am satisfied that, by a proper cultivation, a finer article can be produced than any of the European flax, or at least equal to the finest flax produced in Belgium or France, from which could be manufactured the finest cambric. An article suggesting the culture of flax and hemp appeared in the Melbourne *Age* six years ago, noticing that a premium had been offered by a lady of £50 to a master of a school, denominational or national, who would give successful instruction in the growth of flax and hemp, and their manufacture into rope; and the article goes on to say—"This is a step in the right direction; but as we have been accustomed to regard every kind of production, beyond that of mere food, as all but impossible, from the scarcity and consequent dearth of labour, many arts and manufactures that might be successfully cultivated, and with profit too, have been completely neglected. The time, however, is fast approaching when necessity will suggest a greater variety of industrial pursuits than at present exist, and industry will have a wider field and freer scope in a country possessing so many valuable natural endowments both as regards soil and climate." Now, at the present time, viewing the agricultural interest in its deeply depressed state, any new article of production ought to be of the greatest importance. What then could be ultimately of more advantage to the colony and to the agricultural interest than the successful cultivation of so valuable an article as flax? On examining the land where the flax is growing, I find that the best flax grows on the parts from which the water recedes quickest, the average length of the stalks being nearly three feet, and gradually diminishing in length and strength down to where the water lies for at least five months in the year; there it is found growing equally thick, but not longer than from five to seven inches. This fact at once suggests the necessity of draining; and if these swamps or marshes could be brought down and kept at their summer level, the object will be so far gained by the ground being made ready for cultivation; thus would thousands of acres be made available for growing one of the most profitable and valuable articles the soil could produce. The seeds of the flax yield a most valuable oil, and the oil-cake formed in the manufacture of this oil is most nutritious feeding for cattle. Here then we have—First, the finest fibre; secondly, the seed for oil; thirdly, the cake; and fourthly, the refuse of the flax dressing forms a valuable addition to the manure heap, especially in absorbing the liquid. The variety of industrial pursuits has made the home country flourish, and no doubt in time it will be the same here. I believe the process of steeping the flax is now superseded in England by a chemical process; with this process I am not acquainted, but one thing is certain, it will do much in the saving of labour. Alluding again to the article in the *Age* it further says:—"With all the advantages of machinery and chemical science, it is not too much to hope that a portion of the soil and industry of Australia may be devoted to such a useful purpose as the culture of the flax plant, and that valuable article added to our other productions." More than one hundred thousand tons of flax are annually imported into Great Britain, independent of what is grown in the United Kingdom, and the large quantity grown in Ireland. The *Age* concludes its article by saying:—"Means of employment for all must be gradually developed, and our country, if ever it would become great, must adopt every resource for rendering the soil the great supporter of its population." In reply to your other queries, I would respectfully suggest that a trial might be made on a small scale this year with imported seed, as it is now too late to obtain any quantity of the native seed; that an acre or more land may be secured for the purpose, which has been already broken up, and partially drained. I think that could be secured here. A flax company would succeed better in extending the cultivation of flax than individual enterprise, unless government were to take the initiative, and give it a fair trial, and, if successful, the example would then be followed up very likely by both companies and individuals. There is another way in which I would respectfully suggest that the government might come forward, *i.e.*, by holding out inducements in the way of premiums: something in this way:—To the grower of the largest number of statute acres, £—; ditto second ditto, £—; ditto for the best and cleanest—bushels of seed, £—; ditto for the second ditto, £—. For the best sample of prepared flax not less than — hundred weight, £—; ditto second ditto, £—; ditto third ditto, £—; ditto fourth ditto, £—. And the better to insure the proper cultiva-

tion and cleaning of the ground, it should be made known that the judges in inspecting the crops for the first two premiums will, in giving their decision, pay particular attention to the cleanliness of the land and the general cultivation. I may mention that at home a flax mill of sufficient size for the districts where that article is most cultivated, and which would dry, break, and scutch flax ready for the hickle, would cost from five to eight hundred pounds, according as it was water or steam power; and with warehouse attached from ten to twelve hundred pounds. Here, of course, the cost would be greater; but then, again, if a mill were put up here suitable for a large or small district, it might, for a little extra expense, be made available for other purposes as well, viz., the grinding of corn, the sawing of timber, the pumping of water, or the irrigation of the land with liquid manure, or water from the flax pit (if the steeping process was adhered to). By a successful trial on a small scale opinion then could be easily formed of all the requisites needed. Now, again, as to which would be the best seed to sow, long experience in growing crops and seed and rearing cattle has shown me that what is grown and reared on the place thrives best on the place, and I have found that this is the case as a rule. Where it is not it is the exception, which it may be in the case of the flax seed coming from a cold climate to a milder. What I have said in the first instance as to the flax growing best in land from which the water went off quickest, on examination of various places I found the same rule apply to all. I have made up a parcel of flax to go by the steamer on Saturday first, addressed to you. It contains three parcels of flax, two of green flax as pulled, the largest of which is from the flats here, and in which you will find a few stalks of four feet long or so, pulled from a fence of a field under cultivation and drained. That is an additional proof of what draining will do. The other green parcel is from the small gullies between the sand hillocks at Lowrie's-hill, where we are at present working. I am sorry I cannot send you a cleaner sample of prepared flax; in the one sent the straw is little more than broken from it; but three things were unfavourable—viz., some of the stalks were last year's, some not nearly ripe, and the water in which it was steeped was hard and brackish, and therefore unfit to make a fine sample, even if the whole sample had been nothing more than ripe. However, I look upon it as something interesting; and an eye at all acquainted with flax in examining it can discern in it fibres of the finest description. One great advantage more the lands will derive if the flats and swamps can be drained to their summer level: new grasses will spring up of a more nutritious description, and thereby will be able to carry (or graze) more cattle, as well as improve their condition. I enclose you the remainder of the seed. I have not sent flax or seed anywhere else, except a very small sample Mr. Coulthard got; and I have the honour to be,—Yours, &c.,

H. MURRAY McCALMAN.

The Hon. William Milne, Adelaide.

EXAMINATION PAPERS, 1863.

(Continued from page 672.)

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in May:—

LOGIC AND MENTAL SCIENCE.

THREE HOURS ALLOWED.

All candidates should attempt six Logic questions, answering a part at least of question No. 13, and three questions in each of the other books which they have studied. They may, however, answer as many questions as they can.

1. Logic is concerned about the laws of thought, and not about the truth of things. Explain shortly that statement.

2. How are concepts or general notions formed?

3. What is meant by the extension and what by the comprehension of a concept? Give a few examples. State the law which regulates the mutual relations of extension and comprehension.

4. Give its logical name to each of the parts of this proposition: "To rise early is beneficial."

5. Express the following propositions, using the logical copula: "Man wants but little here below." "Poor people have few friends."

6. What is meant by the quantity and the quality of a proposition? And what are the signs of quantity and quality?

7. What is the rule of distribution in the case of universal affirmatives? Give an example, and also an instance in which the rule is violated.

8. Of what predicables is the species composed? What is Thomson's opinion in regard to the composition of the species?

9. Define Astronomy—a University—a School, naming the two parts of the definition.

10. What is the distinction between immediate and mediate inference?

11. State and illustrate the opposition between A and O.

12. Give a table of the syllogistic figures, taking M for the middle term, S for the minor term, and P for the major term.

13. State the mood and figure, and pronounce on the validity of each of the following syllogisms, pointing out the kind of fallacy which any of them may involve.

(*a*) All wise men speak little.
I am a wise man,
Therefore I speak little.

(*b*) All wise men speak little.
I speak little,
Therefore I am a wise man.

(*c*) The good are loved.
Aspasia was loved,
Therefore Aspasia was good.

(*d*) All vices excite indignation.
Emulation does not excite indignation,
Therefore emulation is not a vice.

(*e*) All humane men are lovers of liberty.
No slave-dealers are humane men,
Therefore, no slave-dealers are lovers of liberty.

14. Construct a syllogism in A A A in the second figure, and show what fallacy it involves.

15. Reduce to the first figure the following syllogism:—

The passions are common to brutes.
The virtues are not common to brutes.
Therefore, the virtues are not passions.

Or construct a syllogism of your own in the third figure, and reduce it to the first.

PALEY'S MORAL PHILOSOPHY.

1. State shortly Paley's arguments in disproof of a moral sense.

2. What, according to Paley, are the constituents of happiness?

3. What is Paley's definition of virtue?

4. Why, according to Paley, am I obliged to keep my word; and what is the difference between an act of prudence and an act of duty? Criticise his doctrine.

5. What is meant by the general, as distinguished from the particular, consequences of an action?

6. Give two or three instances showing that the general consequences of an action may be ruinous to society, while its particular consequences are insignificant.

7. As an objection to the doctrine of utility, it is said that before acting we must calculate the consequences of our actions, but that it is generally impossible to do this. Show how this objection is obviated by means of "general rules."

8. Give a short account of Paley's chapter "On wills."

BISHOP BUTLER'S SERMONS.

1. Against whose doctrines in particular was the moral system of Butler directed?
2. What is Butler's general division of the principles of human nature?
3. What does he mean by "our nature" when he says that virtue consists in following our nature?
4. How does he establish the supremacy of conscience?
5. Explain Butler's doctrine of our appetites and desires, and contrast it with the doctrine which it was designed to refute?
6. How does self-love defeat its own end when it becomes a contracted affection? And how is self-love shown by Butler to be quite consistent with our love of our neighbour? In which sermon are these questions treated of?
7. Give a very short and general outline of his moral system.

STEWART'S PHILOSOPHY OF THE HUMAN MIND.

1. What is Stewart's doctrine of the will "in the case of operations which are become habitual in consequence of long practice?"
2. Distinguish between memory and conception.
3. In what respect do Reid and Stewart differ in their doctrines regarding the imagination.
4. Illustrate "casual associations" as a source of popular superstitions and prejudices. How are such prejudices best cured?
5. Into what principles does Stewart analyse the imagination.
6. Show how sensibility depends on the power of imagination.
7. "Experience diminishes the influence of passive impressions on the mind, but strengthens our active principles." Explain and illustrate this statement.

BACON'S NOVUM ORGANON.

1. Describe the different idols which beset the human mind.
2. Can you state when and where any of the Greek philosophers mentioned by Bacon lived?
3. What does Bacon mean by "Induction by simple enumeration," and what is his opinion of it?
4. How, according to Bacon, have men usually gone to work "in the investigation and discovery of any matter?"
5. How are the empiric, the dogmatist, and the true scientific labourer charcterised by Bacon?
6. How was natural philosophy corrupted by Aristotle, by Plato, and by the new Platonists?
7. What is "the real and legitimate goal of the sciences," and how has it been missed?

LATIN AND ROMAN HISTORY.

THREE HOURS ALLOWED.

SECTION I.

Translate—

Magnanime Aenea, non, si mihi Jupiter auctor
Spondeat, hoc sperem Italiam contingere cœlo.
Mutati transversa fremunt et vespere ab atro
Consurgunt venti, atque in nubem cogitur aër;
Nec nos obniti contra nec tendere tantum
Sufficimus. Superat quoniam Fortuna, sequamur,
Quoque vocat, vertamus iter. Nec litora longe
Fida reor fraterna Erycis portusque Sicanos,
Si modo rite memor servata remetior astra.
Tum pius Aeneas; Equidem sic poscere ventos
Jamdudum et frustra cerno te tendere contra.

1. Parse fully the words, *spondeat, cœlo, transversa, cogitur, sequamur, litora, servata, cerno.*
2. What is the general rule for the construction of *si?* Distinguish between *si dat, si dedit, si det, si daret, si dederit, si dedisset.*
3. Give the perfect tenses indicative of the verbs *contingere, fremunt, consurgunt, obniti, sufficimus, remetior, poscere.*

SECTION II.

Translate—

Excipiunt plausu pavidos, gaudentque tuentes
Dardanidæ, veterumque agnoscunt ora parentum.
Postquam omnem laeti consessum oculosque suorum
Lustravere in equis; signum clamore paratis
Epytides longe dedit, insonuitque flagello.
Olli discurrere pares atque agmina terni
Deductis solvere choris, rursusque vocati
Convertere vias infestaque tela tulere.
Inde alios ineunt cursus aliosque recursus
Adversis spatiis, alternosque orbibus orbes
Impediunt, pugnaeque cient simulacra sub armis;
Et nunc terga fuga nudant, nunc spicula vertunt
Infensi, facta pariter nunc pace feruntur.

1. Parse fully the words, *clamore, paratis, discurrere, ineunt, orbibus, fugâ, pace, feruntur.*
2. Give the perfect tenses indicative and the supines of the verbs *impediunt, cient, diductis, vertunt, factâ.*
3. What moods and tenses may be put after *post quam,* and with what meaning in each case?

SECTION III.

Translate—

Cum ipsâ per sese res anceps esset, prout cujusque ingenium erat atrocius mitiusve suadentibus, tum incertiora omnia unus ex Privernatibus legatis fecit, magis condicionis, in qua natus esset, quam praesentis necessitatis memor, qui interrogatus a quodam tristioris sententiae auctore, quam poenam meritos Privernates censeret, "eam" inquit "quam merentur qui se libertate dignos censent;" cujus cum feroci responso infestiores factos videret consul eos, qui ante Privernatium causam impugnabant, ut ipse benigna interrogatione mitius responsum eliceret "quid, si poenam" inquit, "remittimus vobis, qualem nos pacem vobiscum habituros speremus?" "si bonam dederitis," inquit "et fidam et perpetuam: si malam haud diuturnam."—*Livy.* viii. 21.

1. Parse fully the words, *suadentibus, conditionis, interrogatus, censeret, libertate, responso, diceret, habituros.*
2. Give the perfect tenses indicative of the words, *merentur, censent, viderat, remittimus, dederitis.*
3. What is meant by *oratio obliqua?* Why is *censeret* in the subjunctive mood? Put the last answer of the *Privernat* in the above passage into the oblique form.

SECTION IV.

Translate—

Legati circumstantes sellam orabant, ut rem in posterum diem differret. et irae suae spatium et consilio tempus daret. Satis castigatam adolescentiam Fabii esse, satis deformatam victoriam: ne ad extremum finem supplicii tenderet, neu unico juveni, neu patri ejus clarissimo viro, neu Fabiae genti eam injungeret ignominiam. cum parum precibus, parum causa proficerent, intueri sævientem contionem jubebant. ita irritatis militum animis subdere ignem ac materiam seditioni non esse aetatis non prudentiae ejus. neminem id Q. Fabio poenam deprecanti suam vitio versurum, sed dictatori, si occaecatus ira infestam multitudinem in se pravo certamine movisset. postremo ne id se gratiae dare Q. Fabii crederet, se jus jurandum dare paratos esse non videri e re publica in Q. Fabium eo tempore animadverti.—*Livy.* viii. 32.

1. Parse fully the words, *circumstantes, diem, iræ, injungeret, animis, ætatis, vitio, dictatori.*
2. Give the perfect tenses indicative and the supines of the verbs, *differret, tenderet, proficerent, subdere, deprecanti, versurum, movisset, crederet.*
3. Put the words, "Postremo ne id se gratiæ dare Q. Fabii crederet, se jus jurandum dare paratos esse non videri e re publica in Q. Fabium eo tempore animadverti," into the direct form.

SECTION V.

1. Give an account of the Licinian Rogations.
2. What were the original powers of the Tribunate? Were any modifications made in the office as time went on?
3. In what relation did Latium stand to Rome just after the Gauls had quitted Rome, during the second Punic War, and in the days of the Gracchi?
4. What successive changes were made in the Roman law concerning debt?
5. What were the powers of a Dictator? What were the most important occasions of the appointment of such an officer?
6. Give an account of the first Samnite war.

SECTION VI.

1. Give an account of the Catilinarian conspiracy. What disputed point of Roman law was the Senate called upon to decide in dealing with the captured conspirators?
2. Sketch the life of Pompey.
3. Give an account of the successive Agrarian laws, which were either passed or proposed.
4. Distinguish between the Comitia Curiata, Comitia Centuriata, and Comitia Tributa.
5. By what steps did the Romans become a maritime power?
6. Give an account of the Roman Colonies, and define the rights which the colonists had.

(*To be continued*).

Home Correspondence.

UTILISATION OF SEWAGE.

SIR,—I see that in your impression of August 21st you give Baron Liebig's recent letter on the agricultural value of town sewage, and also a shorter one, introducing it, by Mr. Mechi, in which he says, "It settles definitively the question, hitherto much disputed, of the value of a ton of town sewage, taken at its outlet." And, further on, Mr. Mechi assumes that Baron Liebig's estimate establishes the value of 4d. per ton.

Is it really the case that in Baron Liebig's letter there is to be found a definitive settlement of the important question of the value of the manurial constituents in a ton of average metropolitan sewage? Nothing of the kind. The substance of what Baron Liebig really does say may be stated in a very few words. He says that if the average sewage have a certain assumed composition; and if to every 100 tons of sewage of such composition rather more than 1 cwt. of superphosphate of lime be added, it will then (after deducting the cost of the superphosphate) be worth about fourpence per ton, reckoned according to the constituents it contains; but that, if the superphosphate of lime be not added, it will only be worth 1½d. per ton.

But does Baron Liebig himself claim that his estimate is founded upon sufficiently established information as to the average composition of the metropolitan sewage? Quite the contrary. We have his own opinion upon this point very clearly stated. In reference to the analysis of sewage upon which he founds his calculations, he says, "Lacking more certain data, I take Professor Way's analysis of the sewer water, which this most reliable chemist made at the request of the General Board of Health." Again, "Regarding the component parts of the best sorts of guano, we have certain and reliable data—those relating to sewer water are less so; but we might long ago have been fully informed of its average contents if, last year, at the mouth of each sewer in London, five gallons of water had been collected morning and evening every day during the week, and at the end of the seventh day one gallon of the collected seventy gallons subjected to chemical analysis." And again, "In the calculation of the value of sewer water, there is one factor doubtful, viz., the absolute amount of phosphoric acid, ammonia, and potash, which a ton of the said water contains." What, then, I would ask, does Mr. Mechi mean by telling the public that Baron Liebig's letter "settles definitively the question, hitherto much disputed, of the value of a ton of sewage taken at its outlet?"

But is it even probable, judging from the evidence we have at command, that the average metropolitan sewage is anything like so strong as that upon the analysis of which Baron Liebig bases his estimates? Certainly not. I quite agree with Baron Liebig, that, however much individual samples of sewage may differ from one another, the relation of the ammonia to the other valuable constituents may, upon the average, be considered as pretty definite; and since the ammonia is reckoned to give three-fourths (more or less) of the money value, we may take the relative amounts of ammonia in sewage as indicating approximately the relative values of different samples. Now, Baron Liebig adopts, as the basis of his estimates, the analysis of Professor Way, of a sample of sewage from the Dorset-square sewer, which gave 17·96 grains of ammonia per gallon. In reference to that sample I have this morning received a letter from Professor Way, in which he says that I have his full authority for stating that it was "much above the average," and, he adds, "I should say fully twice the average strength." Again, Messrs. Hofmann and Witt give as the average of their analyses of the undiluted sewage, that is, the sewage without rainfall, 8·2 grains of ammonia per gallon. And again, taking into calculation the rate of flow, &c., Dr. Letheby's analyses, which constitute the most extensive series relating to the Metropolitan sewage, give a lower average still. Lastly, from entirely independent data, I think there is very little doubt that the real average metropolitan sewage would show less amounts of ammonia, and the associated valuable matters, than even the average of Dr. Letheby's samples. In fact, I believe there is no doubt that 10,000 tons of average metropolitan sewage, calculated by Baron Liebig's scale and method, but on the basis of its real composition, would show a value of less than one-fourth of £166 13s. 4d. so triumphantly assumed by Mr. Mechi on the basis of 4d. per ton.

I fully agree with Mr. Mechi, however, that the area over which town sewage can be profitably utilised must very much depend on the cost of application to the land. Indeed, at a recent meeting of the Committee of Sanitary Science at the Society of Arts, I suggested that the Society should take some steps to get reliable engineering information on this point. But what Mr. Mechi can mean by referring to the Croydon meadows, as if the experience there could be any guide as to the cost of raising sewage to given elevations, or were at all in favour of applying small quantities per acre, I cannot understand. It happens that I visited the Croydon meadows only last week. I was informed that the sewage of 18 to 20,000 people, was confined to something under 250 acres, and to succulent crops exclusively. Now, if we say 250 acres and 20,000 people, we have, besides other matters, the excretal matters of about 80 people to each acre; which, at Mr. Mechi's estimate of 16s. per head, would give £64, and at 6s. 8d. per head, the estimate of Mr. Lawes and myself, £26 13s. 4d. for the value of the manurial constituents per acre. But what was the complaint at Croydon? Why, that (notwithstanding, as Mr. Fenton told us in his evidence last year, the dry weather sewage amounts to 800,000 gallons per day, which is equal to 40 gallons per head per day, or 65 tons per head per annum, without rainfall) they had been suffering during this dry season for want of a sufficient bulk of sewage for the area of land under irrigation, and that the crops of meadow and Italian rye-grass had in consequence not answered expectations. The system at Croydon, too, is to let the sewage flow over a given area of land for several days and nights together.

I quite agree with Baron Liebig, also, that "there is one factor doubtful" in the calculation of the value of sewer water, viz., its average composition. I would suggest that a mixed commission of engineers and chemists, in whom all might have confidence, be appointed to superintend the gauging, sampling, analysis, and calculation, in such manner as really to settle definitively the approximate average composition of the metropolitan sewage, as it will have do be dealt with in any plan of utilisation. From my own experience of such matters, however, I do not think it would be sufficient to take samples night and morning only, as proposed by Baron Liebig.

But besides the engineering, chemical, and agricultural factors, there is a moral factor still wanting, without which a satisfactory solution of the sewage question bids fair to be long postponed. This moral factor is courage on the part of all really anxious for the profitable utilisation of town sewage to deal candidly with the public in regard to it, and not to misrepresent the facts of the case. This leads me to say a few words, in conclusion, on Baron Liebig's most unworthy allegation—not only unfounded, but directly contrary to the facts—that the manufacturers of artificial manures are "inimical to the utilisation of sewage, and, in the battle which is being fought, they constitute the inimical army, whose forces should be by no means underrated." Such an accusation may, perhaps, be naturally enough conceived and propagated by those who are directly interested in keeping the public ignorant on this question; but that it should be echoed by Baron Liebig, when himself putting forth estimates and calculations which, if based upon well-established facts, would most strikingly confirm the estimates and views of those he seeks to calumniate, is highly discreditable; though it will be well understood by all acquainted with recent agricultural discussions having no reference to the sewage question. It is, however, doubly discreditable to his prompters here, who, better still knowing the facts, have sought to get the weight of Baron Liebig's authority in condemnation of those whose statements they cannot refute. They seem to forget that, as the public become better informed on the subject, they will be apt to conclude that the allegation of improper motive and bias is perhaps less appropriate against those who fearlessly put the facts before them, in spite of obloquy, than against those who are constantly reiterating erroneous statements.

I am, &c., J. H. GILBERT.

Harpenden, St. Alban's, August 25th, 1863.

Proceedings of Institutions.

BANBRIDGE YOUNG MEN'S MUTUAL IMPROVEMENT SOCIETY.—The eighth annual report congratulates the members and friends on the prosperous condition of this Institution, and on the satisfactory progress it has made. Since the last annual meeting it has been able to rent a house in which the members at all times, during each day, have a respectable place of resort. The number of active and honorary members in immediate connexion with the Society now number 113, which is an increase of upwards of forty during the past year. The reading-room is supplied with newspapers of daily and weekly issue, and the leading periodicals, magazines, &c., of the day. At the last meeting the library was very small; but through the liberality of the Marquis of Downshire (patron of the Society), who presented the Society with 145 volumes of books by the best authors, a good and useful library is being formed. It is hoped that other gentlemen will lend their assistance. The number of essays, discussions, and literary conversations brought before the Society by the active members, since the last anniversary, was, in all, 19; and their literary merit has been in no case under the average standard, while a high tone of thought pervaded many of them. Every paper has been followed by animated discussions; the various topics have been freely criticised, with a desire to arrive at truth; and thus by interchange of ideas respecting their contents, to mutually strengthen and enlighten the minds of the members; and the committee believe that they have been the means of a steady literary advancement on the part of the members. Eleven public lectures have been delivered in the Town Hall, of a valuable character. The following is the list of them:—Rev. J. Coutt's five lectures, viz.:—"John Bunyan and the Pilgrim's Progress." "The Overland Route to India." The Wonders of Nature." "The Frozen Regions, and the Fate of Sir John Franklin, Captain Crozier, and their brave companions." "Switzerland and its Scenery." Denis Leonard, Esq., a reading from Dickens' "Cricket on the Hearth;" Thomas Ringland, Esq., Belfast, on "Money;" The Rev. D. Gordon, on "Our Poets and Poetry;" D. J. Macgowan, Esq., M.D. (late of China and Japan), two lectures on "China and Japan;" John De Fraine, Esq., on "Funny Folks; or, Sketches of the Grumbler, the Gossip, Foppish Young Men, and Affected Young Ladies." The lectures by Mr. Leonard, Mr. Ringland, and the Rev. David Gordon were delivered free of charge to the Society. During the session, there were five classes for the study of music, elocution, history, English composition, and drawing. The four first mentioned classes were presided over by a few of the active members themselves, who, of course, gave their services gratuitously; the members of the drawing class paid their own teacher. The committee have engaged an able teacher, who, at moderate remuneration, will instruct those members who may avail themselves of his services in the French and German languages. Other classes will also be conducted by a few of the active members as formerly. The committee take the opportunity of reminding every friend of this Institution, that so long as it is without a building or hall which it can call its own, its labours cannot be so efficient as they otherwise would be to the rising generation of this locality. The committee also, for some time past, have been desirous to form a small museum, for the instruction of the members, but as yet they have not been able to make much progress. The treasurer's account shows that the receipts have been £93 0s. 2d., and that there is a small balance in hand. In the month of May last a *soirée* was held in the town-hall, under the auspices of the Society.

ASSOCIATION OF LANCASHIRE AND CHESHIRE INSTITUTIONS.—A Conference of the officers and friends of this association was held at the Mechanics' Institution, Manchester, on Saturday, 1st of August, "to receive and discuss information and suggestions calculated to promote and develop the educational interests and agencies of Lancashire and Cheshire. Sir J. P. KAY-SHUTTLEWORTH, Bart., occupied the chair; and there were present, Messrs. J. Hole and Barnett Blake, representing the Yorkshire Union of Mechanics' Institutes; G. Holeroft, Milnes, R. Rumney, J. H. Traice, J. A. Gibb, S. L. Chadwick, J. Greenhalgh, E. Wilde, James Blackburn, Edwin Simpson, Dr. J. Watts, Rev. Dr. Herbert, Dr. Martin; and Dr. Pankhurst, and David Morris, hon. secs. Mr. HOLE said that the means of the Yorkshire Union were limited, in a pecuniary point of view, to about £200 or £300 a year; they had never had more than that sum at their disposal. When the Union was established, in 1827, its main object was to secure a system of lecturing, so that gentlemen going from one Institution to another might have their expenses economised. Owing to the great disinclination of institutions to take paid lecturers, mainly arising from their poverty, the plan was set aside, and manuscript lectures were adopted. This arrangement was found to lose its interest, and it also might be looked upon as a failure. They then adopted a system of gratuitous lectures, which was still in force. The next great step, and one of the most successful that the Union had ever adopted, was the appointment of an agent and lecturer. Had it not been for the exertions of its agent, the Yorkshire Union would probably have sunk down to one-half its present level. In addition to the two principal features he had

named—an agent and gratuitous lecturers—the Union possessed a village library, which was useful in starting little institutions. For instance, if the people of a small town desired to start a library, and had not at that moment the necessary funds, the Union would, at a small charge, lend them 100 or 200 volumes to form the nucleus of their library. Another object that they were accomplishing was the conducting of examinations in connection with the Society of Arts. This was left to Mr. Blake, their agent and lecturer. The Union believed that in the last-named department they were doing more good in improving the institutes than in any way yet attempted, especially by means of the preliminary examinations which had been established by the Society of Arts. That class of examination was best fitted to the status of pupils in mechanics' institutions. Mr. BLAKE said that he also attended as a deputation from the Yorkshire Union, and he should be very glad to offer any advice to the Lancashire and Cheshire Association that his experience dictated. He would first of all suggest that they should publish an annual report. That report would make known to the institutions composing the association what was the constitution of the association, what was done by the agent, and how an institution could secure gratuitous and manuscript lectures. A report would also give advice to those who required it. He found, on examining into many local institutions, that there was a great want of regularity in an important element of success —namely, lecturing. Otley was not a large place, yet it had a most successful institution, and he attributed this state of things to the fact that the institution was continually before the public by its regular weekly lectures. The same might be said of Scarborough. Another element of machinery to which Mr. Hole had briefly alluded was the examinations. By passing the Elementary Examination, any candidate of sufficient age might qualify himself for the Society of Arts. And if young men could be stimulated to undergo these preliminary or elementary examinations, they would be tempted to undergo some of the more trying examinations. As to an agent, he would by all means recommend one. If the funds of the Association would not permit the employment of one at first, information of the constitution of the Association might be circulated by handbills, and Institutions would thus know the method in which it was proposed they should be managed. If an Institution could only secure a committee of three persons—president, secretary, and treasurer—it might partake of all the benefits of the Association. It could even establish local examinations, and so save pupils travelling perhaps miles to undergo their examination at a neighbouring Institute. Local elementary examinations had been most successful in the Yorkshire Union. The CHAIRMAN said that the East Lancashire Union had two organising masters who divided the institutes into two sections or districts, each taking a section. These masters visited the various institutions five days in a week, returning home at night, and on Saturday they gave lectures—one of a course extending over four or six weeks, according to the nature of the subject and other circumstances. One of the masters generally lectured on chemistry, and the other on mechanics, and their lectures were elementary: at any rate, they did not enter into the more recondite questions of their subject. These masters were first-class men. They were from the Diocesan Training School at Chester, where they took high certificates. The resources of the Union were derived from fees of pupils, who paid 2d. or 3d. a week, and from local subscriptions. In addition to the local funds they had a central fund, which belonged to the Union. This fund was contributed by some of the principal gentry and trading firms of the district, and amounted to about, he thought, £200 a year. It was expended in the payment of part of the salary of the masters, the remainder being advanced by those institutions that had the benefit of their instruction. The institution had also to pay £5 for what was termed a candidate teacher, and £10 for a local teacher. The Union had also the benefit of voluntary assistance from gentlemen such as Mr. Wilkinson, of Burnley. One or two of the institutions were conducted without the aid of the organising master, and others were too feeble to receive his visits. If, however, the Union was satisfied those institutes were not sluggishly conducted, they were not deprived of the benefit of sending pupils for examination. The basis of those examinations was to ascertain whether or not the candidates had a good elementary knowledge. Any other plan of examination would be erroneous. With regard to the constitution of the Lancashire and Cheshire Association, they either might have a central fund for the whole Union, as in the East Lancashire Association, or they might divide their district into separate unions, each having a central fund, and the central fund of the association might be looked on as subsidiary to them. The itinerating library, agent, lectures, and diagrams were all important subjects, which he was sure the council would consider. After some further discussion, Dr. J. WATTS proposed the following series of resolutions:—1. That it is desirable that a general council be constituted, composed of eminent men in the two counties. 2. That an executive be formed, selected chiefly from the general council. 3. That the various institutions in union be grouped into sub-unions, with a council for each group. 4. That, for the improvement of class instruction it is desirable, in addition to the services of a general agent, to employ itinerating teachers for special subjects in the various groups of institutions for aiding and superintending the class organisation. 5. That a general system of examination for the whole of the institutions in union be adopted. 6. That efforts be made to enlarge the itinerating library, and to found an itinerating art exhibition. 7. That attention be directed to the formation of a scheme of honorary and paid lecturers. 8. That special attention be directed to the promotion of examinations of the Department of Science and Art, and of the Society of Arts. 9. That the above resolutions, with such alterations and modifications as the present council may deem necessary or desirable, be submitted for adoption to the delegates at the next annual meeting. These resolutions were seconded by Mr. TRAICE, and adopted. The proceedings closed with votes of thanks to Sir J. Kay-Shuttleworth, and Messrs. Hole and Blake, for the information they had given to the conference, and to the chairman for presiding.

MACCLESFIELD USEFUL KNOWLEDGE SOCIETY.—The twenty-seventh annual report says that the Committee cannot congratulate the members upon a revival of the trade of the town, and the consequent improvement in the affairs of the Society which would have followed such a revival. They have not, however, reposed on their oars during the past year, but they have, to the best of their ability, been active in improving the condition of the Institution, the whole of its internal arrangements having been the subject of their serious consideration. They have secured the services of Mr. Hancock (an active and energetic teacher) in conducting the Chemistry and English Literature Classes, the former of which they have re-established. They have re-established the Drawing Class, and they have formed a Singing Class on the Tonic Sol-fa system; a Working Men's French Class, and a class for the instruction of the members in silk manufactures. In effecting these arrangements they beg to acknowledge the invaluable aid and counsel they have received from Mr. Greg, to whom the Society owes a deep debt of gratitude for his exertions. The following tabular statement will show the number and average attendance of the members in their respective classes as now constituted:—

Description of Class.	No. of Membs.	Average Attendance
Arithmetic	52	18
Reading and writing	35	18
Grammar	44	10
Chemistry	48	22
English Literature	41	20

Stenography	12	6
Drawing	23	16
French	34	30
Singing	48	34
Female (reading, writing, and arithmetic)	45	28
Female (sewing)	32	19
Juvenile	72	52

This attendance would have been considerably larger had not the distressed state of the town prevented many of the poorer members from availing themselves of the benefits of the Institution. As an inducement for temporary residents to become members, the Committee have adopted the system of quarterly and monthly payments to the reading-room. The Committee, after giving the names of the holders of prizes and certificates from the Society of Arts, report that E. C. Egerton, Esq., M.P., has kindly redeemed his promise in using his influence in favour of James Mottram, a prize recipient at the last annual meeting, by procuring him a clerkship on the Great Northern Railway. The Committee are glad to report the continued prosperity of the reading-room and library; for the former they have prepared and brought into use a new code of rules, which work advantageously. The library has been increased by about 100 volumes, as many as the funds of the Society would permit the Committee to purchase. The number of volumes circulated during the year ending the 30th August last has been about 14,000. The Committee thank their President for kindly furnishing them with various parliamentary papers. In February last, Mr. Buckmaster, from the Science and Art Department at Kensington, delivered an interesting lecture on the "Minutes of Council on Education." The Committee have had two concerts during the year.

THIRSK MECHANICS' INSTITUTE.—The eighteenth annual report congratulates the members and friends of the Institution on its satisfactory position. The reading-room continues to be well attended, affording a constant source of entertainment and instruction. The library is now open to the members twice a week. This fact, taken in connection with the addition of the works which the committee have introduced, proves that it is becoming more thoroughly appreciated. The circulation of books for the past year has been 3,353 being an increase of 887 over the previous year. The committee have purchased and added to the library 76 volumes, together with 12 volumes of magazines. The number of members has slightly increased, and is for the past and two preceding years as follows:—1860, 147; 1861, 153; 1852, 164. The free-hand and architectural drawing class is resumed under the superintendence of Mr. Bourne, and will prove most valuable to that portion of the members following, or intending to follow, architectural pursuits. The report refers to the success of the candidates belonging to the Institute, in the elementary examinations on the papers issued by the "Central Committee," and recommends these examinations to the special attention of its members. The balance sheet shows that the finances of the Institute are in a favourable condition. The receipts have been £87 19s. 5d.; and the balance in hand is £11 12s. 1d.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, August 28th, 1863.*]

Dated 31st July, 1863.

1894. J. C. Haddan, Bessborough-gardens, Pimlico—Imp. in firearms, and in artillery and projectiles for the same.

Dated 6th August, 1863.

1938. J. G. Pinède, Liancourt, France—Imp. in apparatus for regulating the speed of steam and hydraulic engines.

1947. T. Simmelkiar, Black Rock, Cork, and J. I. Spicer, Parkroad, Old Ford, Middlesex—An improved composition for coating or painting the bottoms of ships or vessels to prevent them from fouling.

Dated 10th August, 1863.

1968. P. Marcos del Rio, Jermyn-street, St. James'—A new machine for obtaining motive power.

Dated 13th August, 1863.

2000. J. Edmunds, Birmingham—An imp. or imps. in gun and pisto furniture.

2004. M. A. F. Mennons, Abingdon Chambers, Westminster—Imp. in the construction of numbering machines. (A com.)

2006. H. Brown, King-street, Cheapside—Imp. in burners for lamps for burning oils or fluids.

Dated 14th August, 1863.

2010. R. B. Greenwood, 416, Hackney-road—Improved means of preventing accidents upon railways.

2012. E. B. Wilson, 5, Parliament-street, Westminster—Imp. in blast furnaces.

2016. N. S. Russell, Great George-street, Westminster—Imp. in apparatus for working great guns.

2018. W. Asbury, Birmingham—Imp. in axles and axle-boxes and the parts of wheels immediately connected therewith.

Dated 15th August, 1863.

2022. G. Davies, 1, Serle-street, Lincoln's inn—Imp. in furnaces for heating, flattening, and annealing glass. (A com.)

2024. R. Parker, Atherton, Lancashire—Certain imp. in presser flyers to be employed in preparing, spinning, and doubling cotton and other fibrous materials.

2026. E. Lord, Todmorden, Yorkshire—Certain imp. in machinery for preparing, spinning, and doubling cotton and other fibrous substances.

2028. J. E. F. Ludeke, 2, Elizabeth-terrace, Islington—Imp. in the means of keeping cameras or other apparatus steady when suspended to balloons.

2032. R. Lightbown, Over Darwen, Lancashire—Imp. in looms for weaving.

2034. G. T. Bousfield, Loughborough-park, Brixton—Imp. in the manufacture of cement. (A com.)

Dated 17th August, 1863.

2036. J. Smith, Cheetham, Manchester—Imp. in machinery for finishing woven fabrics.

2040. W. Longbottom, Barnsley, Yorkshire—An improved lubricator.

PATENTS SEALED.

[*From Gazette, September 1st, 1863.*]

29th August.

577. O. Murrell.
580. A. F. Pagny.
581. G. Hawksley and T. Bissell.
584. C. Garton.
587. T. E. Symonds.
590. G. F. Lyster.
594. G. Price and W. Dawes.
601. J. Pollard.
602. C. M. Palmer & J. McIntyre.
603. J. F. Gits.
606. T. H. Morrell and J. Williamson.
607. E. A. Wunsch.
615. W. Whittle.
616. T. Thornton, E. Thornton, and R. Thornton.
622. W. Jackson & R. Watkins.
623. S. H. Foster, T. Bunney, and J. Anderson.
624. J. Miller.
627. J. Howie.
628. W. Clark.
629. J. Elsey.
632. W. H. Buckland.
634. A. Cuthell.
635. A. W. Makinson.
640. T. Hancock.
642. T. G. Webb.
646. R. Mushet.
647. J. Cowley.
648. H. A. Bonneville.
651. C. H. Lea.
652. W. Inglis.
656. J. R. Gorst.
657. W. E. Newton.
693. J. W. McCarter.
697. W. Young.
702. F. Hoyos.
706. T. Powell.
730. F. Norrington.
778. J. Leach and J. Anderson.
779. J. H. Warrall.
795. G. Davies.
805. W. Clark.
842. G. T. Bousfield.
885. J. N. Brown.
1048. J. J. Robert.
1058. H. Beare.
1180. C. L. Van Tenac.
1291. A. W. Hofmann.
1390. J. J. McComb.
1478. G. Davies.
1513. W. H. Dawes.
1594. J. L. Hughes.
1643. G. T. Bousfield.

PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

[*From Gazette, September 1st, 1863.*]

24th August.

2047. W. Thomson and F. Jenkin.
2062. G. T. Bousfield.
2063. G. T. Bousfield.
2071. P. Effertz.

25th August.

2131. J. Hughes, W. Williams, and G. Leyshon.
2475. J. Silvester.

26th August.

2068. J. Bingley.
2074. C. W. Siemens.
2089. Sir P. Fairbairn.

28th August.

2100. W. S. Underhill.
2128. T. Grimston.
2175. E. Horton.

29th August.

2096. J. H. Johnson.
2124. H. Moore and S. Newberry.
2190. G. Wellman.

PATENT ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

[*From Gazette, September 1st, 1863.*]

28th August.

2037. J. Apperly.